Math 121 S09N03 - Quiz 6
Mar 19 2009

Name: SOLUTIONS
Stu#:

(1) [**7 points**] Determine the critical numbers of $F(x) = x^{4/5}(x-4)^2$.

$$F'(x) = \frac{4}{5}x^{-\frac{1}{5}}(x-4)^2 + x^{\frac{4}{5}} \cdot 2(x-4)$$

$$= \frac{4(x-4)^2}{5x^{1/5}} + \frac{2x^{\frac{4}{5}}(x-4)}{5x^{\frac{1}{5}}} \cdot 5x^{\frac{1}{5}}$$

$$= \frac{4(x-4)^2 + 10x(x-4)}{5x^{1/5}}$$

$$= \frac{(x-4)[4(x-4)+10x]}{5x^{\frac{1}{5}}}$$

$$= \frac{(x-4)(14x-16)}{5x^{\frac{1}{5}}}$$

• $F'(x) = 0$: $(x-4)(14x-16) = 0$

$\therefore$ $x-4=0$, $14x-16=0$

$x = 4$, $x = \frac{16}{14} = \frac{8}{7}$

• F'(x) does not exist: $5x^{\frac{1}{5}} = 0$

$x = 0$

$\therefore$ critical numbers are $x = 0, \frac{8}{7}, 4$.

(2) [**8 points**] Find the absolute maximum and absolute minimum values of

$$f(x) = x^4 - 2x^2 + 3$$

on the closed interval $[-2, 3]$.

$f'(x) = 4x^3 - 4x = 4x(x^2-1) = 4x(x-1)(x+1)$

$f'(x) = 0$ at $x = 0$, $x = 1$, $x = -1$.

($f'(x)$ exists for all real x.)

x	$f(x) = x^4 - 2x^2 + 3$
-2	11
-1	2
0	3
1	2
3	66

$\therefore$ f has an abs. max. of 66 at $x = 3$

f has an abs. min. of 2 at $x = -1$ & $x = 1$.